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ABSTRACT

Stability and predictive validity in the language and play development of 41 toddlers were studied. Links between language and symbolic play of toddlers were examined at 13 and 20 months in terms of homotypic, heterotypic, or mediated models of association. In the homotypic model, performance on a variable is related to performance on the same variable at a later time. In the heterotypic model, performance on one variable is related to performance on another variable concurrently or at a later time. Stability and predictive validity between two variables is explained by a third, remote, mediating variable in the mediating model. Both homotypic stabilities and heterotypic predictions in children's performance were identified. In most cases, associations between toddler abilities held after the introduction of covarying related aspects of maternal stimulation. This suggests that toddlers' representational competencies reflect shared underlying components rather than external mediation. Representational competence demonstrated stability across the second year. Results are discussed with respect to the componential structure of language and the implications of multidimensionality of mind for models of stability and prediction. Citations number 55. (Author/RH)

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REPRESENTATION IN THE SECOND YEAR:

MODELS OF PREDICTIVE VALIDITY OF LANGUAGE AND PLAY

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RUNNING HEAD: Representation in the Second Year

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REPRESENTATION IN THE SECOND YEAR: MODELS OF PREDICTIVE VALIDITY OF LANGUAGE AND PLAY

Abstract

The present longitudinal study concerned stability and predictive validity in language and play development between 13 and 20 months. Specifically, links among components of language and symbolic play were explored during the toddler's second year in terms of homotypic, heterotypic, or mediated models of association. At both ages, relations among components of language (e.g., comprehension and production, pragmatics and grammar) and between language and symbolic play were evaluated. Across age, both homotypic stabilities and heterotypic predictions in children's performance were identified. In most cases, associations between toddler abilities maintained after covarying related aspects of maternal stimulation, suggesting that toddler representational competencies reflect shared underlying components rather than being externally mediated. Representational competence, a factor formed from variance shared by language and play, demonstrated stability across the second year. Results are discussed with respect to the componential structure of language and the implications of multidimensionality of mind for models of stability and prediction.

REPRESENTATION IN THE SECOND YEAR: MODELS OF PREDICTIVE VALIDITY OF LANGUAGE AND PLAY

The present longitudinal study explores cross-age stabilities and predictive validity among prominent aspects of language and symbolic play between 13 and 20 months. In these assessments of second-year competencies, we evaluated three models of intervariable association (see Bornstein & Sigman, 1986; Bornstein & Tamis-LeMonda, 1990; Bradley, Caldwell, & Rock, 1988; Bretherton & Bates, 1984; Kagan, 1971; McCall, Eichorn, & Hogarty, 1977; Nunnally, 1978). One model characterizes the link between child competencies as homotypic. In this model, performance on behavior "A" (e.g., productive vocabulary size) at time 1 is related to performance on the identical behavior "A" at time 2; thus, the model is restricted to lagged associations. In a second model, associations are characterized as heterotypic, with behavior "A" (e.g., productive vocabulary size) relating to a different behavior "B" (e.g., symbolic play); heterotypic associations may be concurrent or lagged. Models of heterotypic association typically postulate that a common latent component "C" underlies observed behaviors "A" and "B", and is responsible for the obtained linkage between them. In a third model, stability and predictive validity between two variables is explained by a third mediating variable "X" that is remote from the observed variables. For example, behavior "A" (e.g., language) relates to behavior "B" (e.g., symbolic play) because

of some maternal behavior "X" (e.g., mothers who stimulate language also stimulate play). This model predicts that, once the exogenous contribution of "X" is removed, within-subject associations will be attenuated.

We used these three models to evaluate relations between components of language and play across the second year of life. It is in this period that children make extraordinary developmental strides in these two important arenas of mental functioning, and we wished to evaluate the exact character of relations between the two. We initially observed children at 13 months, since at this time most have produced their first words and are already advanced in language comprehension. We assessed children again at 20 months, since by this time many have demonstrated a spurt in their productive vocabularies, there is substantial regularity in the general pragmatic meanings children use to express possession, location, action, and so forth, and many children are producing their first word combinations (Bates, Bretherton, & Snyder, 1988). At both ages, there exists substantial individual variation among children in all these measures of language, and these individual differences appear to be valid indices of later linguistic and/or cognitive functioning (Bates, O'Connell, & Shore, 1987; Bates et al., 1988; Braine, 1976; Slobin, 1982).

In parallel with this transition in language, second-year play progresses in sophistication as it moves from exploratory

manipulations towards expressions of pretense in which children enact experiences and events through symbolic gesture. Prior to the first year, sensorimotor acts predominate in children's play activity; children examine objects, produce effects, and explore their concrete functions (e.g., pressing buttons on a toy telephone). Around 13 months, the first "symbolic" acts appear as children use gesture in representation, pretending to talk on a toy telephone or to drink from an empty teacup. Over the next several months, concrete levels of play diminish in frequency and are replaced by more cognitively-based pretense actions. By 20 months, most children are capable of a diversity of symbolic activities which include incorporating others in pretense scenarios (e.g., putting dolls to sleep) as well as sequencing acts of pretense (e.g., stirring in empty teacups and then pretending to drink). (See Belsky, Goode, & Most, 1980; Belsky & Most, 1981; Fein, 1981; McCune-Nicolich, 1981; Tamis-LeMonda & Bornstein, 1991.)

Conceptual similarity in the abstract nature of language and play, their co-emergence at the onset of the second year, as well as consistent associations between the two domains have suggested to many that representational competence may be a common core component underlying their development (Bates, Bretherton, Shore, & McNew, 1983; Fein, 1981; Fein & Apfel, 1979; McCall, 1979; McCune-Nicolich, 1981; O'Connell & Bretherton, 1984; Piaget, 1962; Shore, O'Connell, & Bates, 1984; Snyder, Bates, &

Bretherton, 1981; Ungerer & Sigman, 1984; Ungerer, Zelazo, Kearsley, & O'Leary, 1981; Vibbert & Bornstein, 1989; Watson & Fischer, 1977). In line with this hypothesis, we investigated and found specific relations between children's flexible (i.e., context-free) language comprehension and symbolic play at 13 months; moreover, we found that this linkage remained after removing concurrent significant contributions of mothers' stimulation (Tamis-LeMonda & Bornstein, 1990). The present study is based on subsequent evaluation of the same children and their mothers when toddlers reached 20 months of age. This longitudinal follow-up allowed a parallel comparison of concurrent language-play associations at 20 months, and more centrally it permitted examination of homotypic, heterotypic, and mediated stability and prediction in language and play competencies across the second year.

In these assessments, we took a multidimensional approach to language at both ages, asking how different components of language interrelate and differentially predict symbolic play. Past research has shown that different measures of language are associated with one another during the second year, but reported relations are usually moderate in size. This suggests that language is best conceptualized as "modular," possessing more than a single underlying component; therefore, some components may share variance and others not, some components may relate to play and others not (Bates et al., 1988; Bretherton & Bates,

1984; Tamis-LeMonda & Bornstein, 1990).

Organizing our assessments around three main models of association, we asked, first, which measures of language interrelate and which predict children's symbolic play concurrently during the second year. We expected to observe moderate interrelations among different aspects of language, and only specific aspects of language to predict symbolic play. Second, we asked whether children's relative status on measures of language and on symbolic play is stable across the second year. We expected there to be moderate homotypic stabilities in children's performance in each of these two domains across this time frame. Because language and play are thought (at least in part) to reflect a common factor of representational ability, we also expected heterotypic prediction from language to play, and vice-versa, between 13 and 20 months. We also hypothesized that lagged heterotypic linkages across this 7-month period might be subserved by stability in children's underlying representational competence. Finally, we asked whether predictive relations among measures of language and symbolic play are mediated by exogenous factors, most notably maternal stimulation. Given evidence that mothers may encourage verbal development and play sophistication, links between language and play -- whether concurrent or lagged, specific or general -- may be mediated by prominent features of such maternal stimulation (Belsky, et al., 1980; Bornstein, 1985; Carew, 1980; Fiese, 1990; Hardy-Brown, Plomin, & DeFries, 1981;

Olson, Bates & Bayles, 1984; Tamis-LeMonda & Bornstein, 1989, 1990; Tamis-LeMonda, Bornstein, Cyphers, Ogino, & Toda, 1991; Teti, Bond, & Gibbs, 1988).

METHOD

Sample

Forty-one toddlers (20 males and 21 females) and their mothers participated in two home observations scheduled 7 months apart. Subjects were recruited from private pediatric and obstetric groups in New York City. Toddlers averaged 402 days of age (range = 396 to 411) at the time of the 13-month observation and 619 days (range = 611 to 629) at the time of the 20-month observation. Their mothers averaged 34 years (range = 28 to 42). Subjects were from middle- to upper-socioeconomic status households ($\underline{M}$ = 60 on the Hollingshead Four Factor Index, 1975; Gottfried, 1985), and the majority of mothers (92%) had completed 4 years of college. An additional four toddlers had been seen at the two ages, but their data were eliminated from final analyses since they were univariate and bivariate outliers on language measures and their inclusion in the sample changed patterns of group results (Tukey, 1977).

Procedure

Home visits were scheduled at 13 and at 20 months during times when mothers felt their toddlers would be alert and rested.

At both ages, dyads were videotaped for 15 minutes of free play, and mothers were interviewed about their children's language. Videotaping began only after mother and toddler were acclimated to the experimenter's presence. Mothers were asked to remain with their toddlers and to disregard the experimenter's presence insofar as possible. They were instructed to do whatever they would ordinarily do when their toddlers engage in play. No further instructions were given. At both ages, a set of toys was placed on the floor in front of toddler and mother; these toys included a teapot and cover, clown-doll, spoons, cups and saucers, toy telephone, book, ball, blocks, nesting set, and toy vehicle. Toys were chosen to afford toddlers and mothers an opportunity to exhibit various levels of play ranging from sensorimotor activity to sophisticated pretense (Belsky & Most, 1981; O'Connell & Bretherton, 1984; Ruff & Lawson, 1990; Ungerer et al., 1981).

Data on children's language were based on interviews and performance in the play sessions. Children's play competence, maternal language stimulation, and maternal play stimulation were coded from the play sessions. Toddlers' language and play and mothers' language and play were evaluated by different coders at each of the two ages so that coders of each data set were blind to the nature of all other data sets.

Toddler Measures at 13 and 20 Months

13-month language. Mothers were interviewed about their children's productive and receptive vocabularies using the Bates et al. (1988) language inventory. We elected to examine early language with this inventory because it distinguishes "flexible" from "restricted" aspects. During the language interview, the experimenter read approximately 100 common words or phrases to the mother and asked whether her child demonstrated productive or receptive proficiency with each. If a mother indicated that her child produced and/or understood an item, the experimenter further probed to determine whether any specific gestural, vocal, spatial, or temporal cues were required for the child to display competence with the word or phrase. Language data at 13 months were scored according to procedures developed by Bates et al. (1988) and detailed in Tamis-LeMonda and Bornstein (1990). Briefly, children were credited with production if they demonstrated consistent and appropriate use of a sound which approached the phonetic version of the adult target word (e.g., "baba" for bottle), and they were credited with comprehension if their behavioral response was appropriate to a particular word or phrase (e.g., toddling over to mother if she said "Come here."). Production and comprehension were classified as "restricted" when contextual or other cues were necessary; items which were independent of contextual cues were classified as "flexible" (Snyder et al., 1981). Analyses focus on flexible measures of language production and comprehension. Two coders independently

scored audiorecordings and transcripts of 10% of the language interviews so that coding reliability could be assessed. Agreement for numbers of words and phrases in production and in comprehension was calculated by dividing the number of agreements by the number of agreements plus disagreements. Reliability averaged 92% for production (range = 86-100%) and 97% for comprehension (range = 83-98%); agreement for the flexible-restricted language distinction averaged 92% for production (range = 83-100%) and 90% for comprehension (range = 83-100%).

20-month language. Three components of children's language were assessed. Lexical development was assessed as the magnitude of children's absolute productive vocabulary size; grammar was assessed as children's tendency to link across morphemes by using word combinations, plurals, inflections, auxiliaries, articles, prepositions, and so forth; and pragmatics was assessed as the range of communicative functions that children express in speech. Grammar and pragmatics were determined from transcripts of all child and mother utterances made of the play sessions. All transcripts were coded twice by independent coders, and cross-checked a third time by a different constant coder; this approach to transcribing assured agreement about mother and toddler language. Any utterances that were unintelligible were omitted from analyses.

Productive vocabulary size was estimated using the Bates et al. (1988) vocabulary checklist, collected at the conclusion of

the 20-month visit. This checklist is comprised of nearly 700 words taken from general categories, such as animals, clothes, actions, pronouns, foods, and so forth.

Grammatical usage was based on spontaneous utterances coded for morpheme length following traditional guidelines (e.g., Bates et al., 1988; Bloom, Beckwith, & Capatides, 1988; Bloom & Capatides, 1987; Brown, 1973). Only children's spontaneous utterances were coded, since imitative and responsive utterances might under- or overinflate estimates of children's grammatical ability, as for example in the case of children whose mothers ask many yes/no questions. Mean length of utterance, based on the average morpheme length of the child's five longest spontaneous utterances, served to index grammar. This index was chosen since it is thought to represent children's upper limit of morphological usage.

Pragmatic diversity was also based on children's spontaneous utterances exhibited during the play session. Each utterance was classified into one of 18 pragmatic categories (e.g., actor, action, possession, recipient, rejection/objection, playful routine; a comprehensive list of the pragmatic categories coded along with their operational definitions can be obtained from the authors). These pragmatic categories represent an integration across prior studies on the use of semantic function in second-year language (see Bates et al., 1988; Bloom, 1970; Brown, 1973; Nelson, 1973, 1981). In assessing pragmatics, coders watched the

videotaped session and used contextual cues to interpret the function of children's utterances. In those cases where a single utterance expressed two pragmatic categories, the child was credited with both. Each child received a pragmatic diversity score that reflected the number of different pragmatic categories used; the maximum score a child could achieve was 18. More than 95% of children's spontaneous utterances could be categorized pragmatically. (The remaining utterances consisted of words or phrases expressed with no obvious contextual referents or meaning as well as those expressed solely to service symbolic play; e.g., saying "Hi!" into the toy telephone. They were not considered so as to avoid inflation of language-to-symbolic play correlations.) Interrater reliabilities of pragmatic classifications were calculated by having three independent raters code 15% of the sample. Kappa reliability across the 18 pragmatic categories averaged .88.

13- and 20-month play. Toddler play in the 15-minute videotape was coded over 60 contiguous 15-second intervals. During each interval, the coder noted which of eight states of play the child achieved. Briefly, the eight levels were defined as: (1) Unitary functional activity, (2) Inappropriate combinatorial activity, (3) Appropriate combinatorial activity, (4) Transitional play, (5) Self-directed pretense, (6) Other-directed pretense, (7) Sequential pretense, and (8) Substitution pretense. During a given interval, a child could be credited

with more than one different level of play act. One comprehensive measure of symbolic play was calculated by summing across the frequencies of intervals for levels 5 through 8 and dividing by the total frequency obtained for levels 1 through 8 (see also Tamis-LeMonda & Bornstein, 1989, 1990, 1991). These percentages were arc sin transformed prior to analyses. Intercoder reliabilities for toddler play were obtained by having independent coders score toddler play for 24% of the sample. Kappa agreement across the eight levels of play for matched intervals averaged .77.

Maternal Measures at 13 and 20 Months

Referential language. At both 13 and 20 months, mothers' referential language was coded from the 15-minute free-play session. During each of 60 successive 15-second intervals, the coder noted whether or not mother verbally referred to an object, activity, or event in the environment by describing, labelling, or asking her toddler about the unique qualities of the referent (e.g., "That's a spoon." or "What color is the spoon?"). We chose to examine this form of stimulation since referential language is associated with vocabulary expansion during early language development (e.g., Furrow, Nelson, & Benedict, 1979; Nelson, 1973; Newport, Gleitman, & Gleitman, 1977; Tomasello & Mannle, 1985). Thus, over the entire 15-minute play session mothers could receive a maximum score of 60. Intercoder

reliabilities for referential language were obtained by having independent observers code 17% of the sample. Kappa agreement for matched intervals averaged .73.

Play. During each 15-second interval, coders noted whether or not mothers exhibited a play action by modeling specific play activities for their toddlers or by prompting toddlers to engage in specific play activities themselves. These measures of maternal play are consistently valid predictors of children's play sophistication (e.g., Belsky et al., 1980; DeLoache & Plaetzer, 1985; Lockman & McHale, 1985; Power & Parke, 1982; Rogoff, 1990; Slade, 1987; Tamis-LeMonda & Bornstein, 1990, 1991). Each maternal play act was also coded for its level of sophistication using the same play scale as developed for toddlers. As for toddlers, one comprehensive measure of mothers' symbolic play was calculated by summing across the frequencies of intervals for levels 5 through 8 and dividing by the total frequency obtained for levels 1 through 8, and these percentages were arc sin transformed prior to analyses. Intercoder reliabilities for mother play were obtained by having independent coders score mother play for 17% of the sample. Kappa agreement across the eight levels of play for matched intervals averaged .86.

RESULTS AND DISCUSSION

We begin by reporting descriptive statistics for toddler and

mother language and play, concurrent relations among toddler measures, and concurrent relations between toddler and mother activities at each of the two ages. We then examine zero-order stabilities and predictive relations between 13 and 20 months for toddler and mother variables in terms of the three models outlined earlier, assessing homotypic (Model 1) and heterotypic (Model 2) stabilities in toddler and mother variables between 13 and 20 months and mediated within-toddler concurrent and predictive relations (Model 3). Since significant language-play relations were obtained at both ages, we used structural equation modeling to form an error-free latent variable of children's language and play at each age -- termed "representational competence" -- and we also tested the stability of this factor.

Descriptive Statistics and Concurrent Correlations at 13 and 20 Months

13-months. Table 1 presents descriptive statistics (means, standard deviations, and ranges) and concurrent correlations among 13-month toddler and mother measures. Relations among the toddler measures indicated that language comprehension related significantly to language production, and language comprehension related significantly to symbolic play; language production did not relate to symbolic play. Mothers' referential language was independent of mothers' symbolic play. Mother-toddler interrelations showed that variation in toddler language

abilities was significantly associated with variation in mother referential language, and similarly variation in toddler play was significantly associated with variation in mother play. Mother-toddler language-play cross-correlations were not significant.

Insert Table 1 about here.

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20 months. Table 2 presents descriptive statistics and concurrent associations for the 20-month language and play measures for toddler and mother. Interrelations among the language variables for toddlers indicated that productive vocabulary size, MLU, and pragmatic diversity all covaried positively. In contrast to these consistent interrelations among language measures, toddler symbolic play at 20 months related only to pragmatic diversity. In mothers, referential language related significantly to symbolic play. Individual variation among toddlers in productive vocabulary size and pragmatic diversity was associated with mothers' referential language, and mothers' symbolic play related to toddlers' pragmatic diversity and symbolic play. Relations between mothers' referential language and toddlers' play, and the reverse, were not significant.

Insert Table 2 about here.

Evaluation of Three Models for Children's Language and Play and Mothers' Referential Language and Play

Homotypic stability. Table 3 presents zero-order correlations for all four possible homotypic stabilities in the toddler and mother variables; all were significant. Specifically, between 13 and 20 months children's productive vocabulary size was stable, as was their symbolic play. Similarly, mothers' who exhibited more referential language at 13 months exhibited more at 20 months, and mothers with more symbolic play at 13 months used more at 20 months.

Heterotypic prediction. Table 4 presents 12 possible heterotypic predictions for children and their mothers. As shown, approximately one-half of observed correlations were significant. Specifically, in toddlers 13-month language comprehension predicted pragmatic diversity at 20 months; productive vocabulary size predicted MLU (grammar), pragmatic diversity, and symbolic play; and children's symbolic play predicted their pragmatic diversity. Neither early language comprehension nor symbolic play predicted productive vocabulary size nor MLU at 20 months; nor did early language comprehension predict later play. For mothers, neither play-to-language nor language-to-play heterotypic predictive correlations were significant.

Insert Tables 3, 4, 5 about here

Mediated Predictive Validity. Concurrent and predictive within-toddler relations could be mediated by mother. Thus, it would be premature to characterize toddler stability or predictive validity as reflecting endogenous processes without considering the potential role of maternal mediators. First, as noted above, concurrent associations between toddler and mother measures were all significant. Second, mothers' early referential language predicted all three dimensions of children's later language (see Table 5). Thus, mothers who referred to objects more at 13 months had children with larger productive vocabularies, higher MLU, and greater pragmatic diversity scores at 20 months. Moreover, mothers demonstrated substantial stability in their referential language over this 7-month period (Table 3). Thus, it is possible that concurrent and lagged associations in toddler competencies are mediated by maternal stimulation; if so, this model would best characterize linkages within and across domains in toddlers.

We tested this possibility in several ways. First, we re-evaluated concurrent toddler relations at the two ages while removing the concomitant contribution of mothers' stimulation. Thus, at 13 months, mothers' referential language and symbolic play were partialled from toddler language production and comprehension and from toddler symbolic play, respectively.

Under these conditions, within-toddler associations maintained, partial-*r* for language production with comprehension = .33 and partial-*r* for language comprehension with play = .36, *p*s < .05. Similarly, at 20-months, mothers' referential language and symbolic play were covaried from toddlers' language and play, respectively. Concurrent associations among toddler language variables, as well as the link between symbolic play and pragmatic diversity, maintained under these conditions, partial-*r*s ranging from .39 to .52, *p*s < .01.

For lagged toddler associations, hierarchical regression analyses were used to test unique predictions of the three toddler 13-month measures to each of the four toddler 20-month outcome measures separately, that is over and above the contributions of early and later maternal stimulation. In regressions for language data, mothers' early and later referential language were simultaneously entered on Step 1 followed by entry of the target 13-month predictor on Step 2. In regressions which included toddler symbolic play, mothers' earlier and later symbolic play were entered on Step 1 before the 13-month toddler predictor was entered on Step 2. Thus, the second step of each model reports the unique stability of 13-month child performance to 20-month child performance.

Table 6 presents the results for the two possible toddler homotypic stabilities (i.e., productive vocabulary size to productive vocabulary size, and play to play), and Table 7

presents results for heterotypic models of toddler prediction. The R^2 for the first step of these regressions (i.e., the joint contribution of mothers' earlier and later stimulation to that particular toddler criterion) along with associated model *F* values at that step are provided in the first line under each 20-month criterion. Subsequent lines represent the outcomes of Step 2 of separate regression equations testing the contribution of 13-month toddler predictors to the criterion over and above mothers' early and later influences. Presented for each step are the overall R^2, reflecting the joint contribution of maternal stimulation and children's earlier performance, the R^2 change and associated *F* change value for entry of the child predictor at Step 2, and the *F* for the overall model.

As Table 6 shows, toddlers' productive vocabulary size continued to be stable after considering early and later maternal contributions. In contrast, the moderate stability in toddlers' play over the 7-month period was attenuated to nonsignificance after considering mothers' early and later play.

As shown in Table 7, productive vocabulary size continued to explain unique variance in 20-month grammar and pragmatic diversity over and above 13-and 20-month maternal contributions, and language comprehension and symbolic play at 13 months continued to predict unique variance in pragmatic diversity at 20 months, over and above the significant contribution of mothers' referential language at 13 and 20 months. In contrast, toddlers'

early productive vocabulary size no longer explained unique variance in 20-month play after considering mothers' contributions.

Insert Tables 6 and 7 about here.

Representational Competence

Language and play covaried in children at each age, and as well showed modest prediction across age. It was hypothesized that, at least in part, the association between individual variables of language and play would be subserved by stability in children's underlying representational competence. A latent construct of "representational competence" was thought to be reflected in variance shared between language comprehension and symbolic play at 13 months and in variance shared between pragmatic diversity and symbolic play at 20 months. Structural equation modeling was used to form latent variables from these pairs of language and play measures at each age in order to examine stability in toddlers' representational competence between 13 and 20 months. Prior to forming the two latent constructs, toddler measures were residualized by maternal stimulation. Thus, each latent variable represents underlying shared variance between language and play with error variance, variance not associated with the latent variable, and variance associated with maternal stimulation removed (Martin, 1987).

Insert Figure 1 about here

The structural equation model represented in Figure 1 shows that representational competence at 13 months explained 50% of the variance in representational competence at 20 months, independent of maternal contributions. The goodness-of-fit and chi-square fit indices for the model were good, suggesting that the model (including the formation of the latent constructs) was a fair approximation of the data. These data support the notion that correlations between language and play at 13 months and between language and play at 20 months reflect a common underlying construct of representational competence which itself is stable across the second year of life.

CONCLUSION

The present study examined homotypic, heterotypic, and mediated models of stability and predictive validity in the domains of toddler language and play during the second year. We distinguished among diverse aspects of early language, such as comprehension and production, pragmatics and grammar, in order to explore the specificity of concurrent and predictive language-play relations.

Prior to discussing the main findings, it should be noted that these results might apply principally to the population assessed, the ages targeted, and the methods of data collection

used. Subjects came from a relatively homogeneous population of educated families in New York City. Moreover, data were based on 13- and 20-month observations of naturalistic videotaped interactions of dyads during free-play coupled with maternal reports of children's language. Data collected in other contexts of dyadic interaction, or the use of other methods to assess language and play, could result in other patterns of associations.

Homotypic models examined whether toddlers' performance on specific measures of language and symbolic play at 13 months predicts their performance on identical measures at 20 months, and similarly for mothers whether early referential language predicts later language and early play predicts later play. All of the homotypic relations assessed were significant. Thus, for both toddler and mother, the rank-order of individuals on these measures appears to be consistent over the span of the second year.

A number of concurrent and predictive heterotypic within-toddler relations also emerged. All components of toddler language relate to one another at the two ages; in contrast, language-play associations within age, as well as predictive relations between 13 and 20 months, are highly specific. For example, at 20 months, only pragmatic diversity in language relates to symbolic play. Considering that pragmatic diversity indexes richness of semantic expression, and that symbolic play

indexes expression of meaning through gesture, some link between the two was expected. Across age, children's language comprehension, language production, and pretense play each predicts their pragmatic diversity at 20 months; and 13-month productive vocabulary size alone predicts grammar at 20 months.

What might explain the specificity of these toddler relations? Models of heterotypic predictive validity typically hypothesize that a common latent construct underlies observed behaviors and is responsible for possible linkages between them (e.g., Bornstein & Sigman, 1986). In the case of toddler language and play, it has been theorized that representational competence may be a common factor underlying the two domains (e.g., Bates et al., 1983; McCall, 1979; McCune-Nicolich, 1981; O'Connell & Bretherton, 1984; Piaget, 1962; Snyder et al., 1981; Ungerer & Sigman, 1984; Ungerer et al., 1981). Structural equation modeling indicated that a construct of representation exists and is also stable over children's second year. It may be that the relatively strong stability in representation is responsible for predictive associations observed among the individual measures of 13-month language comprehension and symbolic play on the one hand and 20-month pragmatic diversity and symbolic play on the other.

In contrast, the heterotypic stability between 13-month language production and 20-month grammar appears to be subserved by a different underlying process. It has been suggested that

part of the variation in MLU might be explained by "rote" factors in production, rather than by the richness of children's representations of meaning (Bates et al., 1988). Accordingly, morphology should be better predicted by earlier measures of production rather than by earlier measures of representation, such as language comprehension or symbolic play. This hypothesis is supported in these data. Bates and her colleagues have observed that there are many 20-month-old children who achieve high MLU scores through the use of formulae and "unanalyzed" expressions. Such children were identified in the present study: One repeatedly used the single phrase "Where'd it go?", thereby achieving a high MLU yet low score on pragmatic diversity.

At both 13 and 20 months, maternal stimulation related significantly to toddler abilities in both the language and play domains; moreover, mothers' early referential language predicted toddlers' later language. Analyses of within-toddler concurrent associations and stabilities were therefore re-evaluated, partialling maternal influences, so that models testing unique homotypic and heterotypic toddler predictive validity might be contrasted with a model characterizing toddler interrelations as externally mediated. All concurrent within-toddler associations maintained after partialling maternal contributions, as did prediction between toddlers' 13-month productive vocabulary size and 20-month language measures, and toddlers' 13-month symbolic play and language comprehension and 20-month pragmatic diversity.

However, significant associations between toddlers' early symbolic play and productive vocabulary size and later play were attenuated to nonsignificance after considering mothers' early and later contributions to toddlers' play. Thus, relations among components of language, and between language and play, during the second year appear partly to reflect common underlying processes in the child and partly to be mediated by mothers' stimulation.

These data highlight the componential structure of language. Based on the modest size of relations among language measures, as well as the specificity of language-play relations, language in the toddler's second year appears to reflect several partially dissociable mechanisms that share moderate variation with each other and that co-occur in specific relation to symbolic play (see Bates et al., 1988). Even in instances where significant within-toddler relations obtained, there was considerable dissociation among the measures assessed (i.e., at most 50% of the variance in toddler performance was explained). Different measures of language and play might in part tap a common underlying component of mental ability; apparently, however, there is still much to language and play that is unique to each, and not informed by children's relative ranking on the other. Other dimensions of the toddler, such as individual variation in attention span, affect, or temperament, might explain additional and unique variance in either play or language.

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TABLE 1

DESCRIPTIVE STATISTICS AND CORRELATIONS AMONG TODDLER AND MOTHER MEASURES AT 13 MONTHS

Toddler	M	sd	range	1.	2.	3.	4.	5.
1. Language comprehension	38.7	18.8	10-75	--	.40**	.37**	.35*	.09
2. Language production	6.2	6.0	0-27		--	.06	.32*	-.15
3. Symbolic play	15	13	0-51			--	.01	.29*
Mother								
4. Referential language	29.6	10.1	8-48				--	-.07
5. Symbolic play	35	15	9-78					--

* $p < .05$
** $p < .01$
*** $p < .001$

TABLE 2

DESCRIPTIVE STATISTICS AND CORRELATIONS AMONG TODDLER AND MOTHER MEASURES AT 20 MONTHS

Toddler	M	sd	range	1.	2.	3.	4.	5.	6.
1. Productive vocabulary size	162.1	116.8	8-434	--	.40**	.47***	.19	.29*	.21
2. Maximum length utterance	2.6	1.0	1.0-5.4		--	.52***	.23	.08	.14
3. Pragmatic diversity	9.5	3.5	3-15			--	.55***	.30*	.41**
4. Symbolic play	31	20	2-83				--	.19	.71***
Mother									
5. Referential language	31.2	9.7	9-53					--	.28*
6. Symbolic play	46	20	14-96						--

* $p < .05$
** $p < .01$
*** $p < .001$

TABLE 3

HOMOTYPIC STABILITY IN TODDLER AND MOTHER BETWEEN 13 AND 20 MONTHS

Toddler	
Productive vocabulary size	.59***
Symbolic play	.35*
Mother	
Referential language	.49***
Symbolic play	.32*

* $p < .05$
*** $p < .001$

TABLE 4

HETEROTYPIC STABILITY IN TODDLER AND MOTHER BETWEEN 13 AND 20 MONTHS

A. Toddler

	20 MONTHS			
	Productive vocabulary size	MLU	Pragmatic diversity	Symbolic play
13 Months				
Language comprehension	.21	.11	.41**	.11
Language production	--	.54***	.49***	.41**
Symbolic play	.03	.01	.46***	--

B. Mother

	Language stimulation	Symbolic play
13 Months		
Language stimulation	--	.21
Symbolic play	-.03	--

** $p < .01$
*** $p < .001$

TABLE 5

PREDICTIVE RELATIONS BETWEEN MOTHERS' STIMULATION AT 13 MONTHS AND TODDLERS' PERFORMANCE AT 20 MONTHS

	Toddler 20 Months			
	Productive vocabulary size	MLU	Pragmatic diversity	Symbolic play
Mother 13 Months				
Referential language	.50***	.36**	.41**	.06
Symbolic play	-.30*	-.08	.00	.17

** $p < .01$
*** $p < .001$

TABLE 6

HIERARCHICAL REGRESSIONS ASSESSING TODDLER HOMOTYPIC STABILITY FROM 13 TO 20 MONTHS OVER AND ABOVE MATERNAL CONTRIBUTIONS

Criterion/Step/Predictor	R^2	R^2 Change	F Change	Model F
Productive vocabulary				
1. Mother referential language at 13 and 20 months	.26	---	---	6.52**
2. Productive vocabulary	.47	.21	14.90***	10.91***
Symbolic play				
1. Mother symbolic play at 13 and 20 months	.51	---	---	19.69***
2. Symbolic play	.53	.02	1.46	13.77***

* $p < .05$
** $p < .01$
*** $p < .001$

TABLE 7

HIERARCHICAL REGRESSIONS ASSESSING TODDLER HETEROTYPIC STABILITY FROM 13 TO 20 MONTHS OVER AND ABOVE MATERNAL CONTRIBUTIONS

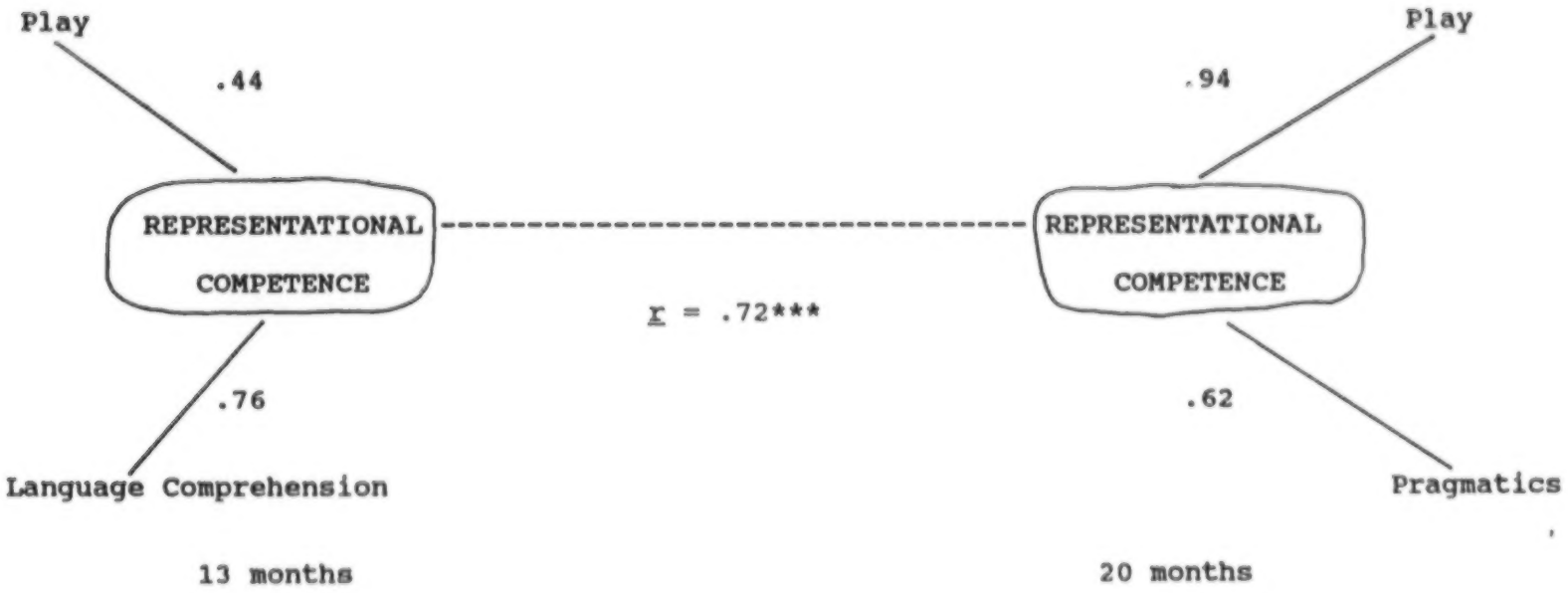
Criterion/Step/Predictor	R^2	R^2 Change	F Change	Model F
Productive vocabulary				
1. Mother referential language at 13 and 20 Months	.26	---	---	6.52**
2. Language comprehension (Model 1)	.26	.00	.09	4.28**
2. Symbolic play[a] (Model 2)	.27	.01	.56	4.49**
MLU				
1. Mother referential language at 13 and 20 months	.14	---	---	3.12*
2. Language comprehension (Model 1)	.14	.00	.02	2.04
2. Language production (Model 2)	.33	.19	10.59**	6.14**
2. Symbolic play[a] (Model 3)	.14	.00	.18	2.10

TABLE 7 (Continued)

Pragmatic diversity				
1. Mother referential language at 13 and 20 months	.18	---	---	4.19*
2. Language comprehension (Model 1)	.26	.08	4.21*	4.44**
2. Language production (Model 2)	.33	.15	8.47**	6.17**
2. Symbolic play[a] (Model 3)	.39	.21	12.96***	8.00***
Symbolic play				
1. Mother symbolic play at 13 and 20 months	.51	---	---	19.69***
2. Language comprehension (Model 1)	.52	.02	1.17	13.58***
2. Language production (Model 2)	.52	.02	1.30	13.66***

a Residualized by mothers 13-month symbolic play.

* $p < .05$
** $p < .01$
*** $p < .001$



X^2 (1) = 1.57, p = .21

GFI = .96

***p < .001

Figure 1. Stability of toddler representational competence between 13 and 20 months (early and later maternal stimulation are partialled).

FOOTNOTE

1. Although we focus on toddler rather than mother, children might mediate covariation and stability in parenting. However, none of the 13-month toddler measures predicted 20-month maternal stimulation; thus, Model 3 is not examined with respect to child influences mediating maternal stabilities.